

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently amended) A method that facilitates establishing a quorum for
2 a cluster within a plurality of computers that are geographically distributed, the
3 method comprising:
 - 4 detecting a change in membership of the cluster at a computer within the
5 plurality of computers; and
 - 6 upon detecting the change in membership,
 - 7 forming a potential new cluster by attempting to
8 communicate with all other computers within the plurality of
9 computers,
 - 10 accumulating votes for each computer successfully
11 contacted,
 - 12 attempting to gain control of a quorum server located at a
13 site that is geographically separate from all computers within the
14 plurality of computers,
 - 15 if successful, accumulating the quorum server's votes, and
 - 16 if a total of accumulated votes includes a majority of
17 available votes, forming a new cluster from the potential new
18 cluster.

- 1 2. (Original) The method of claim 1, wherein detecting the change in
2 membership involves:

3 exchanging heartbeat messages with all computers that are part of the
4 cluster; and

5 upon discovering an absence of heartbeat messages from any computer in
6 the cluster, initiating a cluster membership protocol.

1 3. (Original) The method of claim 1, wherein detecting the change in
2 cluster membership includes detecting that the cluster has not been formed.

1 4. (Original) The method of claim 1, wherein attempting to gain control of
2 the quorum server involves communicating with the quorum server using
3 cryptographic techniques.

1 5. (Original) The method of claim 1, further comprising:
2 exchanging a status message with each member of the new cluster; and
3 updating a local status at the computer to a most recent status available
4 within the status message.

1 6. (Currently amended) A method that facilitates establishing a quorum for
2 a cluster within a plurality of computers that are geographically distributed, the
3 method comprising:

4 providing a quorum server at a site that is geographically separate from a
5 location of a computer within the plurality of computers;

6 assigning at least one vote to each computer within the plurality of
7 computers;

8 assigning at least one vote to the quorum server;

9 attempting to establish communications between each pair of computers
10 within the plurality of computers;

11 accumulating a count of votes for each computer communicated with at
12 each computer;
13 attempting to establish control over the quorum server from each computer
14 within the plurality of computers;
15 if control is established over the quorum server, accumulating the quorum
16 server's votes in the count of votes; and
17 establishing the quorum when a majority of available votes has been
18 accumulated in the count of votes.

1 7. (Original) The method of claim 6, wherein the quorum server grants
2 control to only a first computer attempting to establish control.

1 8. (Original) The method of claim 6, wherein the quorum server grants
2 control to only one computer of all computers attempting to establish control
3 based on a pre-established priority list.

1 9. (Original) The method of claim 6, wherein votes are assigned so that the
2 quorum includes at least one computer that was in an immediately previous
3 cluster, to ensure that a cluster formed from the quorum has current data.

1 10. (Original) The method of claim 6, wherein attempting to establish
2 control over the quorum server involves establishing communications with the
3 quorum server.

1 11. (Original) The method of claim 10, wherein establishing
2 communications with the quorum server involves using cryptographic techniques.

1 12. (Currently amended) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform a
3 method that facilitates establishing a quorum for a cluster within a plurality of
4 computers that are geographically distributed, the method comprising:

5 detecting a change in membership of the cluster at a computer within the
6 plurality of computers; and

7 upon detecting the change in membership,

8 forming a potential new cluster by attempting to
9 communicate with all other computers within the plurality of
10 computers,

11 accumulating votes for each computer successfully
12 contacted,

13 attempting to gain control of a quorum server located at a
14 site that is geographically separate from all computers within the
15 plurality of computers,

16 if successful, accumulating the quorum server's votes, and
17 if a total of accumulated votes includes a majority of
18 available votes, forming a new cluster from the potential new
19 cluster.

1 13. (Original) The computer-readable storage medium of claim 12,
2 wherein detecting the change in membership involves:

3 exchanging heartbeat messages with all computers that are part of the
4 cluster; and

5 upon discovering an absence of heartbeat messages from any computer in
6 the cluster, initiating a cluster membership protocol.

1 14. (Original) The computer-readable storage medium of claim 12,
2 wherein detecting the change in cluster membership includes detecting that the
3 cluster has not been formed.

1 15. (Original) The computer-readable storage medium of claim 12,
2 wherein attempting to gain control of the quorum server involves communicating
3 with the quorum server using cryptographic techniques.

1 16. (Original) The computer-readable storage medium of claim 12, the
2 method further comprising:

3 exchanging a status message with each member of the new cluster; and
4 updating a local status at the computer to a most recent status available
5 within the status message.

1 17. (Currently amended) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform a
3 method that facilitates establishing a quorum for a cluster within a plurality of
4 computers that are geographically distributed, the method comprising:

5 providing a quorum server at a site that is geographically separate from a
6 location of a computer within the plurality of computers;

7 assigning at least one vote to each computer within the plurality of
8 computers;

9 assigning at least one vote to the quorum server;

10 attempting to establish communications between each pair of computers
11 within the plurality of computers;

12 accumulating a count of votes for each computer communicated with at
13 each computer;

14 attempting to establish control over the quorum server from each computer
15 within the plurality of computers;
16 if control is established over the quorum server, accumulating the quorum
17 server's votes in the count of votes; and
18 establishing the quorum when a majority of available votes has been
19 accumulated in the count of votes.

1 18. (Original) The computer-readable storage medium of claim 17,
2 wherein the quorum server grants control to only a first computer attempting to
3 establish control.

1 19. (Original) The computer-readable storage medium of claim 17,
2 wherein the quorum server grants control to only one computer of all computers
3 attempting to establish control based on a pre-established priority list.

1 20. (Original) The computer-readable storage medium of claim 17,
2 wherein votes are assigned so that the quorum includes at least one computer that
3 was in an immediately previous cluster, to ensure that a cluster formed from the
4 quorum has current data.

1 21. (Original) The computer-readable storage medium of claim 17,
2 wherein attempting to establish control over the quorum server involves
3 establishing communications with the quorum server.

1 22. (Original) The computer-readable storage medium of claim 21,
2 wherein establishing communications with the quorum server involves using
3 cryptographic techniques.

1 23. (Currently amended) A system that facilitates establishing a quorum
2 for a cluster within a plurality of computers that are geographically distributed,
3 comprising:

4 the plurality of computers;
5 a network coupling the plurality of computers;
6 a quorum server located at a site that is geographically separate from any
7 one computer of the plurality of computers, wherein the quorum server provides
8 one or more votes to a computer within the plurality of computers that is
9 attempting to form a quorum; and
10 an independent communications link coupling each computer of the
11 plurality of computers and the quorum server.

1 24. (Original) The system of claim 23, wherein the quorum server includes
2 a mechanism for granting control to only one computer of the plurality of
3 computers requesting control.

1 25. (Original) The system of claim 23, wherein the quorum server includes
2 a mechanism for maintaining a list of computers accepted into the cluster.

1 26. (Original) The system of claim 23, wherein the quorum server includes
2 a mechanism for cryptographically ensuring an identity of a computer attempting
3 to establish control.

1 27. (Original) The system of claim 23, wherein the quorum server includes
2 monitoring means to monitor the status of each computer within the plurality of
3 computers.